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Guide to The Game Fishes of Canada

Price Ten Cents

1927

No. 15

Royal Ontario Museum of Zoology

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GAME FISHES OF CANADA.

FOR over fifty centuries the pursuit of game fish has held a peculiar fascination for man. The literature of angling is as old as the classics and is more extensive perhaps than that of any other sport. To-day angling appeals to more people than ever before, and interest in our game fishes is constantly increasing.

It is the aim of this guide to describe briefly the more important game species of Canada. Within the compass of such a pamphlet it is possible to touch on only a few of the outstanding characteristics of each fish,—its relationship to other species, its standing as a game fish, something of its habits and its distribution and the size to which it grows.

No country has a greater abundance or a greater variety of game fish than Canada. We possess the finest fresh water areas in the world. Lakes and rivers of every size and description abound over vast areas of our north country. There is no reason why, with proper management, angling may not continue forever to furnish our people with fascinating and healthful sport. To insure the welfare of our fisheries there must be developed an intelligent interest in them. The present guide has been prepared as a contribution towards such an interest.

FAMILY SALMONIDAE

The Salmon family (Salmonidae) is perhaps the most important and the most interesting of all the families of fish. Including as it does all the salmon and the trout, it comprises at once many of the most highly esteemed game fishes as well as species of great commercial value as food.

The family is confined to the northern part of the northern hemisphere and no country within this area contains greater numbers or a greater variety of salmon and trout than does Canada.

The fishes of this family found in Canada belong to four groups, the Atlantic salmon, the true trouts, the charrs and the Pacific salmon.

The Atlantic salmon (*Salmo salar*) is one of the most widely known and highly prized of all game fishes. It occurs on both sides of the Atlantic and is believed to have been the fish sought by the earliest anglers, the Romans prizing highly the salmon rivers of Gaul and Britain.

It enters the rivers of all the northern countries of Europe, being especially abundant in Great Britain, where the sport of salmon fishing has long been highly regarded. In early days salmon abounded in the rivers of our Atlantic coast, and in the St. Lawrence and its tributaries as far as the head of Lake Ontario.

A large part of the life of a salmon is spent in the sea, and there most of its growth takes place, but it comes into fresh water to spawn. The eggs, of which specimens are shown, are deposited in the autumn on sand, or gravelly bottoms of shallow stretches of water near the headwaters of rivers. The young fry hatch in spring, and when two or three months old begin to show vermilion spots and dark vertical bars or parr-marks. At this stage the young salmon is called a "parr." It remains a parr from one to three years, when it descends to the sea, assumes a bright silvery colour and becomes a "smolt." It has been learned that in England salmon usually return to fresh water to spawn for the first time after spending two years in salt water. A small number return as grilse after spending one year in the sea, while a few spend as much as four years continuously in the sea before returning to spawn. The Atlantic salmon returns again and again to fresh water to spawn, usually, it is believed, to the same stream in which it was hatched.

Through a variety of causes salmon no longer resort for spawning to many of the streams formerly visited for this purpose. In early days the Don, Humber, Credit, and other rivers in the vicinity of Toronto, were famous salmon streams. Now salmon seldom come nearer than the Saguenay river in the province of Quebec. The chief causes of the decrease in their numbers are excessive fishing, disturbing the fish on

their spawning beds, the pollution of rivers by sawdust, waste materials from factories and other injurious substances and the barring of them by dams.

Besides the typical Atlantic salmon we have in Canada two so-called land locked forms, the Sebago salmon and the Ouananiche.

The Sebago Salmon (*Salmo salar sebago*) received its name from Sebago Lake, Maine, the locality from which it was first described. Originally of rather limited occurrence, it has been widely distributed in the United States through fish cultural operations. It occurs naturally in a number of lakes in New Brunswick, the specimens shown in the museum's collection being taken from Chamcook Lake, near St. Andrews, N.B.

The Ouananiche (*Salmo salar ouananiche*) is another fresh water Atlantic salmon whose centre of abundance is Lake St. John in the province of Quebec. It occurs also in a number of the inland waters of northern and eastern Canada, nearly all of which have direct communication with the sea. "Careful observation tends to the belief that it very seldom descends to salt water. But its fresh water habitat the whole year round being from choice rather than necessity, the common practice of speaking of it as a landlocked salmon is simply a common error."¹

As a game fish the Ouananiche takes high rank. Henry Van Dyke writes thus of it, "But the prince of the pool was the fighting ouananiche, the little salmon of St. John. Let me here chant thy praise thou noblest and most high-minded fish, the cleanest feeder, the merriest liver, the loftiest leaper and the bravest warrior of all the creatures that swim! . . .

The Steelhead (*Salmo gairdneri*) of the Pacific coast of America has many characteristics in common with the Atlantic salmon. Indeed the steelhead is a very close relative of the Atlantic salmon, much closer than either of them is to the Pacific salmon, of which there are five species. All of the salmon, both Atlantic and Pacific, as well as the steelhead,

¹The Ouananiche and its Canadian Environment, by E. T. D. Chambers. Harpers, 1896.

spend the greater part of their lives in salt water but resort to fresh water to spawn. All of the Pacific salmons, however, die after spawning, never returning to salt water. The steelhead, on the other hand, in common with the Atlantic salmon, spawns a number of times, returning to the sea after each spawning migration into fresh water. In the sea the steelhead is bluish above with a faint pinkish tinge along the side and shows comparatively few spots. In fresh water it gradually changes from blue to olive green above and more and larger spots appear, while the pinkish tinge along the side gives place to a broad red or purplish band. Coloured thus it is usually called a Rainbow trout. Into some of the rivers of British Columbia there appears to be a number of migrations of steelheads during the year; in others there is only one well-defined migration, that for the purpose of spawning which occurs during winter or early spring. The young steelhead remains in fresh water for some time before descending to the sea. The time spent in fresh water varies from one to several years, and some are believed never to enter salt water, being permanent residents of fresh water.

Rainbow trout (*Salmo irideus*). The term "Rainbow" is popularly applied to black spotted trout which show a red or purplish band along the side. Hence an individual trout may be a Rainbow at one period of its life and a steelhead at another. Not all Rainbows, however, migrate to the sea and become steelheads, for some remain permanently in fresh water either by choice or because they are land-locked. Some of the forms which have been isolated for long ages from their sea-going relatives have developed characteristics by which they may be distinguished from them. There are, therefore, quite a number of types of rainbow trout differing not only in their habits but also in their physical characteristics. The Rainbow trout of Lake Superior is a steelhead, first introduced by the United States Fish Commission in 1895. This trout, a specimen of which is shown in the collection, is now common at Sault Ste. Marie, and in the spring enters many of the rivers tributary to Lake Superior for spawning purposes. It has also extended to Lake Huron and runs into a number of the rivers emptying into Georgian bay. In the Sault

rapids it reaches a size of 10 to 15 pounds, and is very highly regarded by anglers because of its gameness, dash and beauty. It has not persisted in many of the smaller streams into which it has been introduced and should not be planted in any waters without careful inquiry to determine whether conditions are likely to be suitable for it and what effect it may have on other species.

Kamloops trout (*Salmo kamloops*). In many of the lakes of British Columbia occurs a trout, closely related to the steelhead, to which the name Kamloops trout has been applied. Being a game fighter, a beautiful fish in appearance and growing to a large size, it is one of the most popular game fishes of the interior waters of British Columbia. The Kamloops trout does not, so far as known, descend to the sea as does its close relative the steelhead, but remains permanently in fresh water.

Cut-throat trout (*Salmo clarkii*). Another common trout of western America is the cut-throat. It differs in a number of respects from the steelhead-rainbow-Kamloops series of trout previously described. It gets its name from the presence of a deep red coloration on the under side of the lower jaw. It also has teeth on the back of the tongue in addition to the teeth farther forward which all trout possess. As compared with the steelhead and its relatives the cut-throat has a more rounded body, a more pointed snout and a longer head, and its colour pattern, especially the extent of spotting is usually different from that of the rainbow and the Kamloops trout. The cut-throat, however, is extremely variable, and from one region to another differs widely in appearance and characteristics. In game qualities it is not usually so highly regarded as the Rainbow or the eastern brook trout, but is by no means lacking in those qualities which appeal to the angler. It occurs naturally as far east as the eastern slope of the Rocky Mountains whereas the trout previously described (Steelhead, Rainbow and Kamloops) were originally confined to waters much nearer the Pacific coast.

The Brown Trout (*Salmo fario*) is native to Europe but has been extensively introduced in America, especially in the United States. It thrives best in clear, cold, rapid streams

and at the mouths of streams tributary to lakes, having much the same habits as our eastern brook trout. Its back and sides are decidedly brown. The back is covered with black spots and the sides with red spots.

The Loch Leven Trout (*Salmo levenensis*) originated in Loch Leven, the lake made famous by Scott's poem, "The Lady of the Lake". It differs somewhat in colour and markings from the typical Brown Trout, but is now considered merely as a local form of that species. It too has been widely distributed in America.

The Charrs (*Salvelinus*) are the finest of the Salmonidae, both in beauty and game qualities. The term "charr" is not in common use in America in spite of the fact that our finest game fish belongs to this group.

The common names applied to our fish were bestowed on them by the early English-speaking settlers of America. In England they have a charr as well as a trout, but the charr is a rare fish there. The charr of Europe has been described by Jordan as follows: "There is another and a finer fish, found in the coldest and clearest lakes of the Alps and of northern Europe, dark coloured and spotted with bright red, . . . This is a finer and more beautiful fish than any of the trout and it is very much less abundant." It is known in England as the charr (*Salvelinus alpinus*), but being found there only in the lake district of Cumberland the name "Charr" was doubtless unknown to most of the early English-speaking people who came to this continent. It is, therefore, not surprising that the "red-spotted, fine-scaled, dark-coloured, speckled beauty" found in the brooks of eastern America should have been called a trout instead of a charr.

The eastern brook trout or speckled trout (*Salvelinus fontinalis*) is not the only charr found in America. The Dolly Varden (*Salvelinus spectabilis*) is a charr, and there are a number of others which are more closely related to the charr of Europe than they are to our two native American charrs (Dolly Varden and eastern speckled trout). In Greenland, and at points along the northern coast of Canada is found a charr very similar if not identical with the charr of Europe. It is found, too, along the Labrador coast, for in

common with our own charr, it will take to salt water. Some of the so-called sea trout of this region are no doubt of this species. Comparatively few specimens of it have been examined by scientists and hence its exact relationship to the European charr has not been decided. It is usually referred to as *Salvelinus stagnalis*. The Red Trout of Quebec (*Salvelinus marstoni*) (see below), the Oquassa trout (*Salvelinus oquassa*) and the Sunapee trout (*Salvelinus aureolus*), found in a few isolated lakes in Maine and New Hampshire, are also close relatives of the European charr. Recently another charr of this group (*Salvelinus timagamiensis*) has been described from a small lake in the neighbourhood of Lake Temagami.

The Speckled Trout¹ (*Salvelinus fontinalis*) is generally regarded as the finest of our game fishes. In a number of points it is perhaps surpassed by other species, but considering its beauty, its all-round game qualities, the delicacy of its flesh and its habitat in the swifter and colder waters of unspoiled regions, its place of pre-eminence among the game fishes of the world is generally admitted. The size to which it grows, as well as its coloration, is affected by the water in which it lives. In small brooks it reaches maturity when only a few ounces in weight, while in larger streams it reaches a weight of several pounds. The Nipigon river is famous as the home of the largest speckled trout. The largest specimen taken in recent years weighed 14½ pounds. In this collection are shown two specimens from the Nipigon, one a coloured cast prepared in the museum and the other a mounted specimen. The latter specimen was the record trout taken in Nipigon waters in 1921. Its weight was 7 pounds. In addition there is exhibited a series of casts showing a number of the different colours assumed by speckled trout, depending on the character of the water which they frequent.

Where it has access to the sea the speckled trout resorts to salt water to feed, returning to fresh water to spawn. Such

¹In the east the term "Brook Trout" is often applied to this species but this is not a distinctive name as the same term is applied in the west to a small brook-inhabiting form of the Rainbow trout.

sea trout¹ have been regarded as forming a distinct variety, but they are merely sea-run brook trout. They take on a silvery colour just as do other typically fresh water forms on entering the sea, and their flesh is said to become of a deeper salmon colour.

The Dolly Varden Trout (*Salvelinus spectabilis*) is another of our charrs or red-spotted trout. It is common in many of the streams of western America, where it is distinguished by the name of the Bull trout. Northwards it abounds in the sea and reaches a weight of ten or twelve pounds. As usual with trout, in small streams and lakes it matures at a size of only a few inches in length. In beauty and gameness it is said to be very similar to its eastern cousin (*Salvelinus fontinalis*) but in many places it is despised because of its reputation of being destructive to the eggs of salmon and trout.

Red Trout of Quebec (*Salvelinus marstoni*). This Canadian representative of the Arctic Charr of Europe is one of the most beautiful of our game fishes. Its distinguishing features are a marked fork in the tail fin, a body more slender than the speckled trout, and an extremely deep red coloration on the lower sides of the spawning male. Little has been recorded regarding its game qualities. It is said to be found in lakes rather than streams. Some describe it as a deep water fish that will not take the fly while others say it rises to the fly, leaps repeatedly when hooked and fights desperately.

The Lake Trout (*Cristivomer namaycush*) is closely allied to the charrs. It is commonly grayish, with many light spots, never showing the red spots characteristic of the true charrs. Its colour and markings vary widely, however. In some waters

¹The term "sea trout" is applied to many different species of trout when taken in salt water. The different members of the family Salmonidae vary widely in their sea-going habits—some, such as the salmon, both Atlantic and Pacific, spend most of their lives in salt water, others, such as our typical trouts and charrs, prefer fresh water but take readily to salt water whenever they occur in rivers flowing into the sea. All, however, spawn in fresh water. In the sea all the trouts tend to take on the same silvery coloration and to grow larger and plumper than the same species in fresh water. So far as known there is no species of "sea trout" distinct from the fresh water forms.

it is quite light, in other almost black, while in the larger lakes it is often greenish. The light spots also vary considerably in size, and specimens have been examined in which the ground colour was light and the spots dark. In the Great Lakes it reaches a weight of fifty pounds and over, and is one of the most important of the commercial species of those waters, being usually sold under the name Salmon Trout,¹ an entirely erroneous name. In smaller inland lakes it is commonly regarded as a game fish, being usually referred to as the gray trout, Mackinaw trout, Namaycush or Togue. Often the trout in neighbouring lakes will differ so markedly in coloration and game qualities as to lead anglers to regard them as distinct sorts, but so far as is now known all the various forms belong to a single species, although it may be that there are racial differences within the species. The term Red Trout is sometimes applied to forms of this species which show a reddish coloration on the lower sides. The same name is also applied to fish from some of the Great Lakes which have reddish flesh. Such Red Trout should not be confused with the Red Trout of Quebec (*Salvelinus marstoni*) (see page 10).

Pacific Salmon. None of the five species of Pacific salmon compares in game qualities with the Atlantic salmon. The best in this respect is the Tyee, King or Chinook salmon (*Oncorhynchus tshawytscha*), but the coho (*O. kisutch*) is also sought to some extent as a game fish and the Little Red Fish or Kennerly's salmon (*O. nerka kennerlyi*), a diminutive or land-locked form of the Sockeye salmon is sometimes angled for in some of the interior waters of British Columbia.

The five species of Pacific salmon all live in the ocean, ascend rivers in the spring and summer, spawn in fresh water in the fall, and then die. No Pacific salmon so far as known returns to salt water after spawning.

The King, Tyee or Chinook salmon (*Oncorhynchus tshawytscha*) is the largest of the Pacific salmon and the

¹The term "salmon trout", like the term sea trout, is applied to a number of different species. In Alaska, sea-going Dolly Vardens are called salmon trout and in other regions other species are called by the same name. Because it is not distinctive of any species the name salmon trout should be dropped.

best of them from the anglers' point of view. It is the earliest to "run", entering the coastal rivers in spring. It is also the largest of the Pacific salmons, averaging about twenty pounds in weight. It is said to run only in streams of large size, fed with melting snows. Both the spring and coho salmon will take the fly but trolling is the favourite method for taking them, and considerable numbers are caught by this means in the waters around Vancouver Island.

FAMILY THYMALLIDAE

The Grayling (*Thymallus signifer*) is allied to the trout, but differs from it in many important characters. Its chief distinctive peculiarity is the very large dorsal fin. Grayling are characteristically sub-arctic fishes and are found in Europe and Asia as well as America. A few are found in scattered localities farther south. In Michigan the grayling (*Thymallus tricolor*) is now limited to a single stream. Another form is found in western Montana. It is, however, widely distributed in northwestern Canada and in Alaska. By sportsmen the grayling is considered a gamey fish, but it is not so strong as the brook trout and perhaps less wary. The Rocky Mountain whitefish (*Coregonus williamsoni*) is often, though erroneously, called grayling.

FAMILY ESOCIDAE

The Pike; Great Northern Pike; Jackfish (*Esox lucius*). By many the pike is not recognized as a game fish, but in waters where better game species are not found its capture provides a considerable amount of sport. It is greedy and voracious and lurks in hiding under lily pads or among water weeds to snap up such smaller species as may come within its reach. It sometimes reaches a considerable size, specimens of 20, 30 and even 40 pounds being not very uncommon in some of our northern lakes.

The pike ranges across the continent from Labrador to Alaska, into Siberia and thence across northern Asia and Europe.

The Maskinonge (*Esox masquinongy*). As a game fish the maskinonge is usually given a very high rank, but the

consensus of opinion among anglers probably supports Henshall in his statement that it can hardly be compared to the salmon, black bass or brook trout for pure gameness. No doubt a good deal of the interest in catching a maskinonge is due to its immense size. It is, however, a good fighter, and one has to be something of an angler to land thirty or forty pounds of maskinonge. It is found only in the Great Lakes region. In Ontario its distribution is somewhat irregular. It is found in the St. Lawrence about the Thousand Islands, in the waters of the Trent Valley, Lake Scugog, Lake Simcoe, in the Georgian Bay, Lake Erie and in isolated localities in northwestern Ontario as far as the Lake of the Woods district. The maskinonge reaches a large size, specimens of 40 pounds weight being not uncommon.

There is no agreement as to the record weight of this fish for Ontario. According to Field and Stream's table of record weights a specimen weighing 51 pounds 3 ounces was taken by rod and reel in Wisconsin and a specimen weighing 75 pounds is said to have been taken there by other means.

The maskinonge may always be distinguished from the pike by the scaling on the cheek and opercle (behind the cheek, a membrane bone which covers the gills). In the pike the cheek is entirely scaly, while the opercle is scaly above with the lower half bare. In the maskinonge the cheek and opercle are scaled above but both are naked on the lower half. The colour of the two fish is different. The pike is usually bluish or greenish gray, with many whitish or yellowish spots. The maskinonge has round or squarish blackish spots of varying size on a ground colour of grayish silvery.

The name of this fish is spelled in a great variety of ways, some of which are muskallunge, muscalonge, muscallonge, muscallunge, muskellunge, musquellunge, masquinongy, maskinongy.¹

¹In regard to the proper method of spelling the word, E. T. D. Chambers of the Quebec Department of Game and Fisheries says: "The maskinongé derives its name from the Indian mashk (deformed) and minonje (pike) and was applied to it by the Indians because it appeared to them a deformed or different kind of pike from that to which they had been accustomed. The river of the same name that flows into Lake St.

FAMILY CENTRARCHIDAE

The Small-mouthed Black Bass (*Micropterus dolomieu*) is one of the outstanding game-fishes of America. Dr. James A. Henshall, author of the "Book of the Black Bass", says: "He is plucky, game, brave, unyielding to the last when hooked. He has the arrowy rush and vigour of a trout, the untiring strength and bold leap of a salmon, while he has a system of fighting tactics peculiarly his own. I consider him inch for inch and pound for pound the gamest fish that swims." While there is no unanimity in this estimate it is generally agreed that the small-mouthed black bass stands among our leading game fishes and has the advantage of being able to tolerate some of the effects of civilization better than the speckled trout. It prefers cool, clear, rocky streams but is at home in many lakes, frequenting many rocky shoals, especially where there is some current. As with other fishes the colour of the bass varies with its surroundings. As a rule bass and trout are not found in the same waters and bass should never be planted in trout waters or vice versa. The bass is widely distributed in Ontario, being particularly at home in the Georgian Bay, Rideau lakes and Kawartha lakes. North of the French River it occurs only in relatively small and isolated areas.

The majority of the bass taken are under three pounds in weight, but occasionally much larger specimens are caught. In the twenty-five years of the Toronto Daily Star contest for Ontario bass there have been two of 7 pounds 4 ounces, one of 7 pounds 3 ounces, one of 7 pounds 2 ounces, and one

Peter, which name has been extended to the town built at its mouth and to the county of which it is the chief lieu, was doubtless so called from the number of these fish taken in or near its estuary. Considering that the popular name of this fish has come to us from an Indian source in the earliest days of the country, it is unfortunate that an apparent desire to get away from the French orthography has produced a confusion of names similar to those applied by American writers and lexicographers to the ouananiche, which they anglicanize as "wannanische" or "winnanische!" They similarly use the forms "mascalonge," "muscalonge," or "muskellongé" for maskinongé. However, they are "ouananiche" and "maskinongé" in the statutes of Canada and of the Province of Quebec, and such are the forms that will survive in the homeland of the fish in question.'

of 7 pounds. Loudon, in his book on The Small-Mouthed Bass, records a specimen weighing 8 pounds 10 ounces taken in 1888 in Glen Falls Lake, New York State. Field and Stream's latest table of record fishes (1924) gives 9 pounds as the weight of the largest small-mouthed black bass. This specimen was taken in South Carolina in 1917.

The Large-mouthed Black Bass (*Aplites salmoides*) is very much like the small-mouthed bass in appearance, but the mouth is larger, in the adult the end of the upper jaw reaching beyond the eye. The scales on the cheek are quite large, being in 6 to 10 rows on the cheek, in contrast to 12 to 17 rows on the cheek in the case of the small-mouth. The two species are found in the same region but seldom in the same waters. The large-mouth is most abundant in mud-bottomed ponds and lakes where it haunts the weed beds along the water's edge. It flourishes in sluggish waters that the small-mouthed bass will not tolerate. It occurs, too, in the colder and clearer waters, and in such situations is scarcely inferior to the small-mouthed species as a game fish but in sluggish and warmer waters it lacks something of the dash and fight of its near relative. Because of its ability to tolerate warmer water it is found much farther south than the small-mouth. It also reaches a larger size. With us it is not uncommon to catch fish of five or six pounds in weight, and specimens of eight pounds are occasionally reported. The record for this species is 20 pounds 2 ounces: locality, San Antonio, Florida.

FAMILY PERCIDAE

Yellow Pickerel, Pike Perch, Wall-Eyed Pike, Doré (*Stizostedion vitreum*). The Pickerel, as this fish is commonly called in Canada, is quite a good game species, as well as an excellent food fish. It is a species of very wide distribution throughout Canada, and in many localities where trout or bass do not occur its capture affords considerable sport. Its flesh, too, is firm, white and flaky and of excellent flavour. Were it not that we possess other and better game species the pickerel would undoubtedly take high rank as a sporting fish.

In some parts of the United States this species is called the pike and our pike (*Esox lucius*) is called the pickerel.

THE CONSERVATION OF GAME FISH

Our game fish have shared the fate that has befallen all our desirable game animals. With the advancement of civilization they have been reduced almost to the vanishing point, except in regions far removed from settlement. There is now, fortunately, a growing interest in the conservation of our wild life. The strict enforcement of protective laws and the creation of sanctuaries are doing much for the increase of our birds and game animals. The development of hatcheries for rearing and distributing young fish to waters in which the desirable species have become depleted is perhaps responsible for the lack of concern on the part of the average person at the ever decreasing numbers of game fish. But hatcheries alone cannot remedy the situation.

Fish can no longer live in many streams and lakes which were once filled with trout or bass. Waters are being poisoned by acids and other wastes from gas works, mills and factories of various kinds. Sawdust has been dumped into lakes until the small animals on which fish live have been smothered and little or no fish food is available. The streams that once flowed through forests, now run through cleared fields where there is little or no shade. The water is too warm for trout. The clearing of the forests and the draining of swamps have driven out the game fish in another way. In early days the snows in the bush melted slowly, the swamps held back the moisture. Now the rivers in cleared districts are in flood for a short time in spring, and in summer almost dry up. The floods of spring, loaded with sand from ploughed fields, scour the stream bed, washing away the eggs of fall spawning species such as trout, and clearing the stream of most of the materials which support the little animals on which game fish feed. Fish cannot live on water alone. A stream can support only as many fish as can obtain a living in it. The spring flood and the nearly dried up stream of midsummer both decrease the number of food organisms that a stream will support. There is no thought that our cleared land be planted to forest trees and the swamps replaced if this were possible, but spring floods are undesirable for many reasons and other

interests demand that our streams do not dry up in summer. The reforestation of the headwaters of our streams is being urged by other interests than those of angling.

Even in waters that have not been changed from their primitive purity game fish are getting scarce. Each stream or lake will produce only so many fish. If too many are taken out, not enough are left to reproduce their kind by natural means. A farmer who made a practice of selling more than the annual increment of cattle off his farm would soon reduce his breeding stock to such an extent that his annual increase would be small. The same law holds in the case of trout. No sportsman should think of taking more fish than the law permits. The taking of undersized fish is especially bad. No game fish should ever be taken from the water until it has reached sufficient size to have reproduced its kind at least once. The taking of fish during the spawning season is prohibited because at such times most kinds congregate in relatively large numbers in limited areas where they may easily be destroyed. If fish are subject to continual disturbance on their spawning grounds their normal reproduction may be so reduced that few young are produced. No sportsman worthy of the name will ever take a bass during or immediately following the spawning season, for the male guards the nest until the eggs hatch and protects the school of helpless young for some time afterwards. To take unfair advantage of the fighting instinct which prompts the parent to protect its young is contrary to every canon of good sportsmanship. With their guardian gone the young soon fall a prey to the many enemies searching for them in the stream.

The angler should think a little, too, of the effect of his angling. He tries to take desirable species and to avoid taking others. To the extent to which he is successful, the undesirable sorts are thereby given the advantage in their competition with the game fish. In overfished waters the natural balance has been so upset that chub and dace, suckers and carp have increased enormously as the trout and bass have decreased. The latter, instead of being the dominant forms, keeping the others in check, have lost their hold and

have difficulty in maintaining themselves at all. Such a situation is especially unfavourable for the young and even though millions of fry are produced by our hatcheries they have small chance of surviving in such situations. Some steps for reducing the number of undesirable fish in our overfished waters are necessary.

Original conditions in our lakes and streams are gone, and gone forever. There is no hope and no desire of ever having our country as it originally was, but existing conditions can be improved. Nature has a wonderful power of recuperation. If our game fishes are given an even chance they will come back, but our efforts to remedy the situation must be based on knowledge. Where would agriculture, forestry, medicine, engineering or any of the other applied sciences be without the aid of the scientific research worker? Would progress be possible? Until we come to realize the necessity of guiding our actions by accurate and definite knowledge no real progress is possible. Such knowledge can come only through painstaking investigations.

The greatest single factor in the conservation of our game fish is the development and spread of the ideals of good sportsmanship. Without the spread of such ideals among those who fish no amount of regulation or law enforcement will save our fish from practical extermination, but with every fisherman a sportsman the greatest step in the conservation of our game fish will have been taken. While the aggregate food value of our game fish is considerable it is negligible in comparison with the recreational value of angling, not only to the country financially but to the individual in healthful, out-of-doors recreation. Anglers individually and in associations should realize that the preservation of the sport in which they are interested depends as much, or perhaps more, on the spread of the ideals of sportsmanship as it does on law enforcement or the application of scientific knowledge to fish propagation and conservation.

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